

# Let's Protect Our Cannoneers' Ears!

By Maj. H. S. Howard, FA<sup>1</sup>

"All cannoneers have hairy ears," goes the old saying, carrying with it the erroneous implication that nature thus provides an effective protective device against the shock of muzzle blast. This of course is not so. Although it does include certain natural protective devices, the human ear is not designed to withstand such a severe shock.<sup>2</sup> Many cannoneers, it is true, use cotton or fingers in their ears, or open their mouths, or try other methods to afford relief from the temporary discomfort of muzzle blast. But the problem is much more than a matter of temporary discomfort—witness, for example, the number of older artillerymen with a permanent loss of hearing. What can be done to insure our cannoneers protection from this danger? This article suggests an approach to this problem.

The advent of peace is no reason why the problem is not still with us; every day irreparable damage is being done to some cannoneer's ears, even at our service schools. This is largely because of a lack of proper recognition of the problem and the failure to include an adequate appreciation of the danger and of the safeguards which should be practiced as part of the professional training of all artillerymen.

First, let's examine the problem generally. The muzzle blast created by a shell being propelled from a modern artillery weapon creates sudden and intense pressures, more so in certain areas surrounding the weapon than in others. In which of these areas is the human ear endangered by even a single exposure, and in which by exposure only over a period of time? The results of studies which have been made to answer this question, while not conclusive or exact, do delimit in a general way certain areas surrounding a piece according to the degree of danger to the ear. With the 105-mm howitzer, for example, it is estimated that there is a *danger area*—"one in which organic injury to personnel *equipped with cotton ear plugs* might be possible"<sup>3</sup>—beginning about halfway between the muzzle and the breech and extending from the muzzle forward 20' or more and *laterally* 10' or more (see sketch). It

is further estimated that there is an *excluded area*—"where a person could not work efficiently during long continued fire"<sup>3</sup>—which *includes the breech* area and extends forward 30' to 40' therefrom and laterally some 30'. Note that this breech area includes the position in which the gunner and cannoneer No. 1 perform their duties. Of course the effect of muzzle blast in both areas will vary with the type of shell, powder charge used, atmospheric conditions, position of shields, and susceptibility of the cannoneer's ears. It seems reasonable to assume that these "danger" and "excluded" areas are greater for higher caliber weapons.

Regarding the "danger area," as described above, the uninitiated may comment that no one would be so foolish as to be in front of the guns when they are firing. How many times, however, have you seen batteries in position receive a target on their flank, and shift trails so that some pieces are firing so as to place cannoneers of adjacent pieces in their "danger area," at least laterally if not longitudinally? Or how about eager wire crews laying wire through the "danger area" from the gun position to a forward observation post? And what protection is *assured* cannoneers who have to work in the "excluded area" so that over a period of time they will not develop permanent hearing difficulty?

At this point it seems pertinent to inquire into the present state of knowledge in the Field Artillery regarding this subject. What is included in our training literature and training programs, and what practices are actually followed in the field? As to the general state of knowledge—make a test. Inquire of the next artillery officer you meet how close he would permit pieces to fire so as not to endanger personnel. What is the prevailing practice in his battery as to use of ear plugs or other protective devices? Ask him whether continued exposure to artillery fire in the breech area can lead to permanent hearing difficulty. In all probability you will get an indefinite answer, or a frank statement that not much thought had been given the subject. Repeat the experiment ten, twenty, or thirty times—I am confident the answers will be "confusion confounded." At least that was the experience in making an unofficial test at a service school. Now draw upon your own observations. You will undoubtedly recall many instances in which firing was accomplished not only with personnel in "danger areas" but also with personnel in "excluded areas" over extended firing periods either with no protective devices available, or where the matter of use of ear plugs or cotton waste was left up to the individual cannoneer's choice.

Nor does our training literature or program contribute any great help. The nearest pertinent item recalled is the provision in A.R. 750-10 (Range Regulation) that "if any part of Area D (the area just in front of the muzzle) is to be occupied, the trajectory must clear any personnel or material

<sup>1</sup>With over 15 years' service in the Field Artillery, including Organized Reserves, National Guard and AUS duty, and having suffered a permanent hearing loss as a result of exposure to Field Artillery weapons, the author a presently a hard-of-hearing patient at Borden General Hospital. Consequently, he feels personally motivated and qualified to write on this subject.

<sup>2</sup>For a scientific discussion of this subject see "The Effects of Explosions on the Acoustic Apparatus" by H. B. Perlman, M.D., Transactions American Academy of Ophthalmology and Otolaryngology, July-August, 1943.

<sup>3</sup>"The Area About a 105-mm Howitzer to Be Excluded to Personnel Due to Muzzle Blast." Ballistic Research Laboratory Memorandum Report No. 249, Aberdeen Proving Ground, 19 November, 1943. Italics inserted by author.

object by 5 yards and 2 forks" (par. 9a), which does not afford protection from muzzle blast in the "danger area."

The foregoing is in the nature of destructive criticism. What should be done? For one thing, this danger is certainly of sufficient magnitude to justify reference to it in our training literature—for example in the field manuals "F. A. Firing" and "The Firing Battery." All artillerymen should be thoroughly familiar with this problem so as to prevent personnel from being in "danger areas" during firing or in "excluded areas" over extended periods of time without adequate protection.

As to adequate protection, industry has been experimenting for some time with fitted ear plugs in such occupations as welding, riveting, chipping and comparable activities.<sup>4</sup> Composition ear plugs have been manufactured which, while permitting normal conversation, are claimed to "exclude unwarranted noise." It is understood that one type has been adopted by the Navy and by some branches of the Army. It is submitted that if the claims made for them can be substantiated, these ear plugs should be adopted forthwith for Field Artillery use, and all cannoneers—or at least those who have to work in "excluded areas"—should be required to wear them.

Finally one step should certainly be taken at once. No individual entering the service with a hearing difficulty should be assigned to the Field Artillery or other comparable branch. To do so subjects such an individual unnecessarily to the probability of a greater and perhaps permanent hearing impairment as a result of exposure to Field Artillery weapons.<sup>5</sup>

<sup>4</sup>See "The Prevention of Ear Disability in Industry" by David A. McCoy, M.D., The Journal of the American Medical Association, April 24, 1943, Vol. 121, p. 1330. In his article on "Prevention of Traumatic Deafness" in the Archives of Otolaryngology, June, 1943, pp. 757-767, Capt. Wm. H. Wilson, Medical Corps, AUS, points out that "Dickson and associates, in a thorough study of protective devices for the ears, found that the most effective single means was an ear plug composed of some solid but pliable substance." and gives as a reference: Dickson, E. D. D., and Ewing, A. W. G. "The Protection of Hearing," J. Laryng. & Otol. 56:225-242 (July), 1941.

<sup>5</sup>"Persons with impaired hearing are more susceptible to acoustic trauma than are those with normal hearing." from "Prevention of Traumatic Deafness" by Capt. Wm. H. Wilson, Medical Corps, AUS, Archives of Otolaryngology, Vol. 37, No. 6, June 1943, p. 767.

<sup>6</sup>See p. 17, The Annals of American Academy of Political and Social Science, May 1945, "The Physically Disabled," by Tech. Info. Div., Office of Surgeon General, U. S. Army.

This is not a mere academic question—over half of the hard-of-hearing cases treated at Army general hospitals involve hearing defects which existed prior to entry into service.<sup>6</sup>

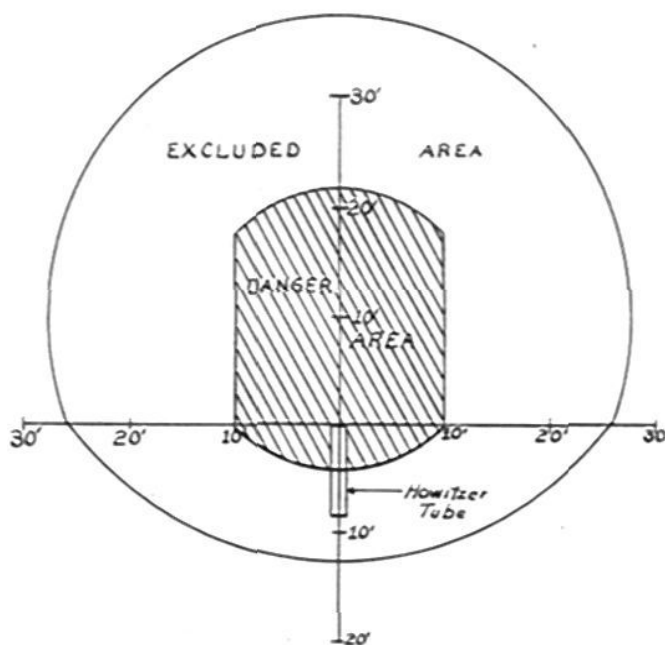
To accomplish this recommended step at the time of enlistment or induction will require that the quality of ear examination now given be improved. The audiometer, the standard device for the measurement of hearing, should be available to examiners to measure any suspected hearing impairment accurately. This recommended step assumes great

importance at this time in view of the prospective new training program wherein all young men would receive a year's training even though not physically qualified for combat troop duty. Not only do new soldiers or trainees deserve an adequate ear examination and proper classification and assignment but also considerable future expense to the government would be averted thereby through the reduced need for later auditory treatment and pensions.

This whole problem involves many technical matters entirely beyond the scope of field artillerymen. To develop the proper framework for such a program, close coordination with the Ordnance Department and Medical Corps will obviously

be necessary. It is interesting to note that the Navy has a Gun Blast Committee (Taylor Model Basin, Navy Department, Cardarock, Maryland) with which valuable liaison could undoubtedly be accomplished. As was mentioned above, studies made to date of the "danger and excluded areas" are not conclusive or exact, and further research in this field seems desirable, particularly for higher caliber weapons. Close coordination and consultation with auditory specialists to include, perhaps, some audiometric research at the Field Artillery School might prove very helpful.

In summary, then, since "all cannoneers *do not* have hairy ears" a four point program is recommended to protect them from the harmful effects of shell blast: (1) inclusion in the professional knowledge of artillerymen adequate information as to the nature and extent of this danger through proper incorporation in training literature and by insistence upon proper practice in the field; (2) the mandatory use of scientifically designed ear plugs, at least by all personnel required to work in "excluded areas"; (3) proper examination of the ears and proper classification of personnel upon entrance into the military service so that no individual already having hearing difficulty will be assigned to the Field Artillery, and (4) continuous study and research by field artillerymen in collaboration with auditory specialists.



Approximate "Danger" and "Excluded" areas surrounding 105-mm howitzer firing charge seven.